

Claims

- [c1] A weld wire comprising:
a sheath encapsulating a metal core made of powdered metal, wherein a fill percentage of the metal core is higher than approximately 12%; and
the metal core having a core composition alloyed with an alloying element or a combination of elements comprising Cr, Mo, V, W, Hf and Nb or combinations thereof, wherein a total weight percentage of the alloying element or the combination of elements in the core composition does not exceed approximately 1%.
- [c2] 2.The weld wire of Claim 1, wherein the alloying element is Mo in the amounts selected from the range of about 0 to about 0.5 percent by weight.
- [c3] 3.The weld wire of Claim 1, wherein the fill percentage of the metal core is selected from the range of about 12% to about 30 %.
- [c4] 4.The weld wire of Claim 1, wherein the total percentage of the combination of elements is selected from the range of about 0.4% to about 0.8%.
- [c5] 5.The weld wire of Claim 1, wherein the composition mainly comprises,
approximately,

C 0.021-0.043%,
Mn 1.0-1.69.0%,
Si 0.33-0.66%, and
Ni 0.016-0.033%

and the fill percentage of the metal core is higher than approximately 12%.
- [c6] 6.The weld wire of Claim 1, wherein the alloying combination comprises,
approximately,
Cr Up to 0.5
Mo Up to 0.5
W Up to 0.5
V Up to 0.5

Hf Up to 0.5

Nb Up to 0.5.

[c7] 7. An improved productivity weld wire comprising a sheath encapsulating a steel core having a core fill percent of more than 12%; and the steel core having a composition comprising an alloying element selected from the group consisting of Cr, Mo, V, W, Hf and Nb and combinations thereof, wherein a deposition rate of the weld wire when used during welding increases with the increase of the core fill percent.

[c8] 8. The improved productivity weld wire of Claim 7, wherein the deposition rate increases from about 15 lb/hr for the core fill percent of about 12% to the deposition rate of about 20 lb/h for the core fill percent of about 30%.

[c9] 9. The improved productivity weld wire of Claim 7, wherein a total weight percentage of an alloying element does not exceed approximately 1%.

[c10] 10. The improved productivity weld wire of Claim 8, wherein a total weight percentage of Mo varies from about 0% to about 0.4%.

[c11] 11. The improved productivity weld wire of Claim 7, wherein the steel core is made of a compacted metal powder.

[c12] 12. An improved productivity weld wire comprising: a sheath encapsulating a metal core, wherein a core fill percent of the metal core is higher than 12%; and the metal core having a composition alloyed with an alloying element or a combination of elements comprising Cr, Mo, V, W, Hf and Nb or combinations thereof, wherein a total weight percentage of the alloying element or the combination of elements in the core composition does not exceed approximately 1%, and wherein a travel speed of the weld wire when used in welding ranges from about 65 in/min to about 145 in/min.

[c13] 13. The improved productivity weld wire of Claim 12, wherein the travel speed of the wire when used in welding is a maximum travel speed ranging from about

80 in/min to about 145 in/min for the core fill percent ranging from about 12% to about 30 %.

[c14] 14. The improved productivity weld wire of Claim 12, wherein the travel speed of the wire when used in welding increases from about 65 in/min to about 90 in/min.

[c15] 15. The improved productivity weld wire of Claim 13, wherein the maximum travel speed of the wire when used in welding corresponds to the composition comprising a percentage of Mo ranging from about 0% to about 0.4%.

[c16] 16. A method of manufacturing a weld wire comprising:
forming a sheath into a shape which can be filled with a metal powder;
filling the sheath with the metal powder, the metal powder having a composition alloyed with an alloying element or a combination of elements comprising Cr, Mo, V, W, Hf and Nb or combinations thereof, wherein a total weight percentage of the alloying element or the combination of elements in the core composition does not exceed approximately 1%;
compacting the metal powder to form a metal core; and
drawing the wire to achieve a core fill percentage of the metal core no less than 12%.

[c17] 17. The method of Claim 16, wherein the core fill percentage ranges from about 12% to about 30%.

[c18] 18. The method of Claims 17, wherein the alloying element is Mo and wherein the total weight percentage of Mo ranges from about 0% to about 0.4 %.

[c19] 19. The method of Claim 16, wherein the total weight percentage of the combination ranges from about 0.4% to about 0.8%.

[c20] 20. The method of Claim 16, wherein the alloying combination comprises,
approximately,
Cr - Up to 0.5
Mo - Up to 0.5

W - Up to 0.5
V - Up to 0.5
Hf - Up to 0.5
Nb - Up to 0.5.

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